

New York University
Progress Report [No. 7]
Constant Level Balloon, Section II
July 1947

PROGRESS REPORT

Covering Period from June 1, 1947 to
June 31, 1947

CONSTANT LEVEL BALLOON

Section II

Research Division, Project No. 93

Prepared in Accordance with Provisions of Contract
W23-099 ac-241, between
Watson Laboratories, Red Bank, New Jersey
and
New York University

Prepared by Charles S. Schneider

Approved by Professor Athelstan F. Spilhaus
Director of Research

Research Division
College of Engineering
July, 1947

II. ABSTRACT

The first successful, though nominal, constant level flight was made in a series of launchings at Alamogordo, New Mexico. Navy permission was given for New York University to purchase the Navy-sponsored polyethylene balloons from General Mills. This opens up the first source of large, light-weight plastic balloons. First delivery was made on the subcontract with H. A. Smith Coatings, Inc. for the 15-foot diameter heavy polyethylene balloons. Improved type ballast reservoir was designed and procurement started. Equipment was prepared for a second series of flights at Alamogordo in July.

III. a. PERSONNEL

The following men were hired:

<u>Name</u>	<u>Duties</u>	<u>Qualifications</u>
Dorion, Richard	Navigator, Draftsman	Former B-17 Radar Navigator. Undergraduate Mechanical Engineering Student.
Higgins, Robert L.	Equipment Construction	Undergraduate Mechanical Engineering Student. Army Instrument Mechanic at Oak Ridge.
Morrell, Paul	Equipment Construction	Undergraduate Engineering Student. Merchant Marine Engineer.

ADMINISTRATIVE ACTION

Clearance was obtained from the U. S. Navy for the purchase of plastic balloons from General Mills, Inc., Minneapolis, Minnesota.

b. COMMUNICATIONS

6/16(1) Correspondence during this period was as follows:

<u>Date of Correspondence</u>	<u>Address</u>	<u>Abstract</u>	<u>Answer</u>
6/16/47	Mr. A. P. Garry, Watson Labs., AMC, Alamogordo AAF, N.M.	Forwarding check for equipment recovery reward	None required

<u>Date of Corres- pondence</u>	<u>Address</u>	<u>Abstract</u>	<u>Answer</u>
6/16/47	Mr. F. M. Cooper 959 Whittier Ave. Akron 2, Ohio	Specification of large balloon sent and appointment requested to dis- cuss manufacture	Considering problem before mailing bid.
6/19/47	Contracting Offi- cer, Watson Laborator- ies Red Bank, N. J.	Enclosing copies of Special Report #1	None required.
6/19/47	Mr. Douglas Rig- ney Watson Labora- tories Red Bank, N. J.	Request for addi- tional Army weather equipment	Being procured.
6/23/47	Chief of U. S. Weather Bureau Washington 25, D. C. Att: Mr. B. C. Haynes	Request for Big Springs radio- sonde station to monitor Alamo- gordo flights	Active coopera- tion received.
6/23/47	Kollman Instru- ment Div. Square D Company Elmhurst, N. Y. Att: Mr. Paul Goudy	Order to modify dribble mounting and rate of flow.	Complied with.
6/24/47	WIRE Mr. O. C. Winsen General Mills Minneapolis, Minn.	Request 7 foot balloons have means of attach- ing shroud lines to carry load.	Complied with.
6/26/47	Mr. O. C. Winsen General Mills Minneapolis, Minn.	Order to ship re- maining 7-foot balloons to El Paso. Request for estimate on bal- last gripping devices.	Complied with. General Mills awaiting ballast - sample.

(2) Conferences

The following conferences were held during the month of June:

<u>Date</u>	<u>People Present</u>	<u>Where Held</u>	<u>Discussed</u>	<u>Conclusions</u>
6/12/47	H. A. Smith, Messrs. Schneider, Moore	New York University	Manufacture of Poly-ethylene balloons for this project.	2 each 15 ft. diameter balloons would be completed by 1 July.
6/13/47	Dr. Peoples, Messrs. Ireland, Mears, of Watson Laboratories, Messrs. Schneider, Moore, J. K. Smith, Hackman of N.Y.U.	Watson Laboratories Red Bank, N. J.	Results of Alamogordo flights	Communications will be improved, next flight's set-up accomplished.
6/17/47	Mr. Paul Goudy, C. B. Moore	Kollman Instrument Co.	Modification of the Ballast valve	
6/20/47	H. A. Smith, Messrs. Moore, J. R. Smith	New York University	Different types of solid ballast	Granular lead is better than sand or various powders.
6/23/47	Mr. Gordon Vaeth, Commander G. W. Hoover, J. K. Smith, C. B. Moore	Sands Point Office of Naval Research, Port Washington, L. I., N. Y.	Request for clearance on General Mills Balloons. Request for Lt. H. F. Smith (USNR) to accompany project to Alamogordo.	Granted.

c. 1. GENERAL WORK ACCOMPLISHED

Field tests were conducted at Alamogordo Army Air Base during the week of June 1, using clusters of meteorological balloons. The primary object of these tests was to perfect handling and launching techniques for large flights and to check the operation of the various altitude controlling devices developed for this project. At the same time, the tests afforded the opportunity to carry aloft payloads of Watson Laboratories equipment. In general, while the flights were successful in the sense of carrying Watson Laboratory gear aloft for an extended period of time, difficulties and materiel failures encountered served to emphasize the unsatisfactory characteristics of meteorological balloon clusters. A technical report under preparation will contain discussion of the flights.

After the return from Alamogordo, the remainder of the month was occupied with preparations for a second field trip to Alamogordo Army Air Base for tests to be conducted in July.

Twenty-five seven-foot diameter 1 mil. thick polyethylene balloons were received from General Mills. One each fifteen-foot diameter 8 mil. thick polyethylene balloons was received from H. A. Smith, Inc.

A seven-man balloon crew departed for Alamogordo Army Air Base on June 27 to make the second series of launchings there.

The plastic ballast reservoir used for the first flights in New Mexico was too fragile to take launching stresses. An aluminum reservoir, mounted on legs containing a built-in filter was designed and a supplier was located. The capacity of the new reservoir is 5 gallons (30#) though it will weigh only 2 pounds. It is believed that the aluminum reservoirs if recovered may be used repeatedly.

2. Specific Problems

The greatest problem encountered during the field tests at Alamogordo was the unpredictable and highly variable effect of superheat on meteorological balloons. The unpredictable increase in lift of the cluster under the rays of the sun was as much as 25% higher than the initial lift. This in several instances resulted in the inability of altitude control balloon cut-offs to stop the ascent of the balloon train at the desired altitude.

The extreme low temperatures encountered at high altitudes apparently has considerable effect on the operation of electrical equipment used in altitude control.

In several cases squibs used for altitude control failed to fire at extremely high altitudes. It is believed that placing a small load on batteries may help keep cells warm enough to produce the necessary voltage at high altitude on future flights.

3. Limitations

The greatest factor hindering the progress of work is still the lack of available space at New York University.

d. METHODS OF ATTACK

Field tests at Alamogordo indicated that a Helios-type cluster is much superior to a long cosmic-ray type flying line in case of fabrication, handling and launching when it is necessary to use clusters. Therefore, this type of cluster where the balloons are all at the same level, will be used on all future multiple balloon flights.

Large plastic balloons have been obtained and will be flown at Alamogordo during the tests to be conducted in July.

e. APPARATUS AND EQUIPMENT

The main sand ballast-dropping device was improved as a result of experiments at Alamogordo by constructing the ballast tubes of aluminum rather than plastic, and by using stronger paper diaphragms as the frangible support for the ballast.

f. CONCLUSIONS AND RECOMMENDATIONS

Opinion has been strengthened that clusters of meteorological balloons will never be a satisfactory method of achieving constant altitude for long period flights. Various factors which weigh against the success of such flights are: the inherent vertical instability of extensible balloons; the rapid deterioration of neoprene under the rays of the sun (average 6 hour life); the complex set of ballast and lifting equipment required; the variable and indeterminate effects of superheat; and the difficulty of launching a long train assembly, even under the best conditions.

In general, equipment must be strengthened and higher safety factors must be used to withstand the strains of launching and the oscillations of the balloon train in flight.

One or more observation posts, downwind, are needed for Alamogordo releases; each post should have theodolite and radiosonde observers and equipment. Better communications between, and coordination of observation posts is vital for satisfactory

tracking of balloons in flight. Aerial observation of the balloons greatly assists interpretation of performance data. Better radio transmission of data is needed from the balloon.

IV. FUTURE WORK

Plastic balloons have been obtained from both General Mills and H. A. Smith, Inc. and will be flown on the next field trip to Alamogordo in July. Arrangements have been completed to obtain as large a supply as is necessary of these balloons and tests will be conducted frequently to perfect a technique of maintaining a balloon at nominal constant altitude.